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RENESAS TECHNICAL UPDATE

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Product Category	MPU/MCU		Document No.	TN-RA*-A0140B/E	Rev.	2.00
Title	Capacitive Sensing Unit (CTSU2) Capacitance reduction characteristics due to power supply ripple noise		Information Category	Technical Notification		
Applicable Product	RA2L1 Group RA2E1 Group	Lot No. All	Reference Document	RA2L1 User's Manual: Hardware R01UH0853EJ0150 Rev.1.50 (Aug. 2024) RA2E1 User's Manual: Hardware R01UH0852EJ0150 Rev.1.50 (Jun.2024)		

1. Information regarding the capacitance reduction characteristics due to power supply ripple noise

The superimposition of ripple noise on the VCC power supply might affect the CTSU2 circuit control current and cause a decrease of the capacitance value measured on the TSn terminal, depending on the noise frequency distribution and maximum amplitude. Please consider the provided reference characteristic data when designing the VCC power supply circuit, and adjust the CTSU2 operational settings as needed with referring the following application note (R30AN0453).

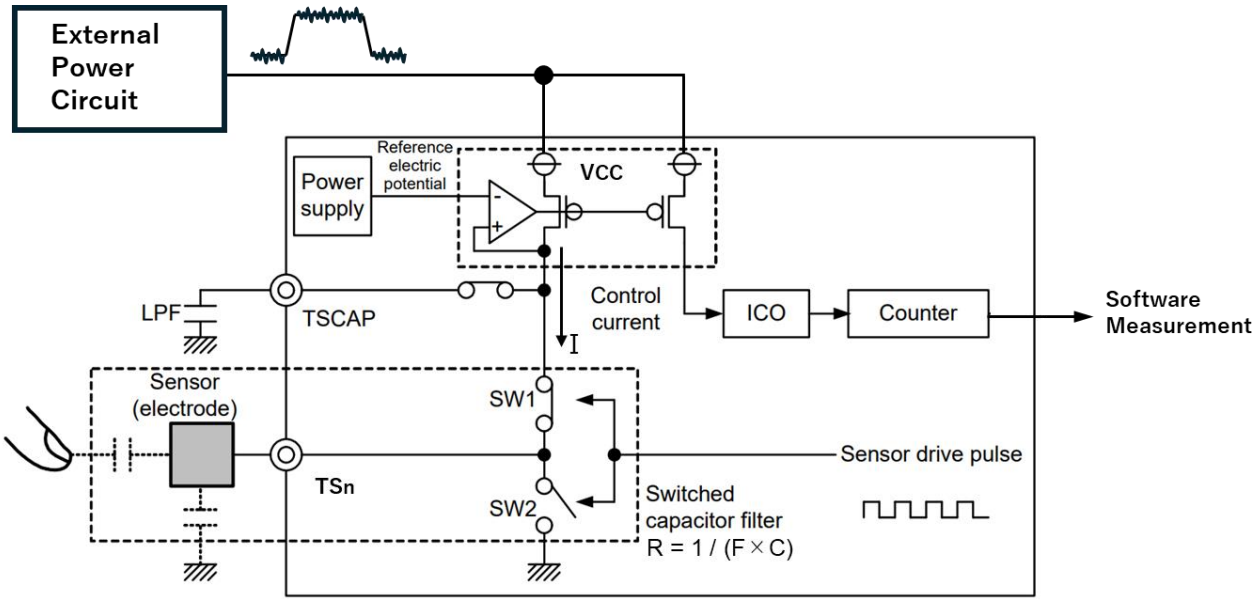

Figure 1 Measurement circuit

For the calculation method of the measured capacitance value of the CTSU2 when ripple noise is superimposed, please refer to " 3.4 Touch Parameter Adjustment (2) RL78/G22 Capacitance / Measurement Value Conversion Formula" and "3.4.2 Example of Countermeasure against False Touch Judgement" in the Application Note Capacitive Touch Ripple Countermeasures Guide (R30AN0453).

2. Characteristic data

Table 1 Capacitive Sensing Unit (CTSU2) Measured capacitance reduction characteristics due to VCC power supply ripple noise (reference value)

Conditions: 2.4V ≤ VCC ≤ 5.5V, VSS = 0V, TA = −40 to +105℃, Cp = 20pF

Item		Symbol	Min	Typ	Max	Unit	Test Conditions (Ripple Noise Amplitude)
Measured capacitance reduction characteristics Note	Ripple noise frequency < 20 kHz	C_{down}	—	—	0.02	pF	100 mVpp
	20 kHz ≤ Ripple noise frequency ≤ 2 MHz		—	—	0.06		40 mVpp
			—	—	0.10		60 mVpp
			—	—	0.33		100 mVpp
	2 MHz < Ripple noise frequency		—	—	0.01		100 mVpp

Note. This is the value under the following conditions.

- When using the Self-capacitance method (CTSUCRAL.MD1 = 0) .
- When the measured current range is 40uA (CTSUCRAL.ATUNE1 = 1, CTSUCRAH.ATUNE2 = 0). For an overview of measured current range, refer to "2.2 Self-capacitance Method" and "2.2.2 Measurement Range" in the Application Note Capacitive Sensor MCU Capacitive Touch Introduction Guide (R30AN0424)
- When the target value for offset adjustment is 37.5%. For an overview of offset adjustment, refer to "2. Capacitance Detection" and "7.1 Automatic Tuning Using QE for Capacitive Touch" in the Application Note Capacitive Sensor MCU Capacitive Touch Introduction Guide (R30AN0424).

Remark. Cp: parasitic capacitance

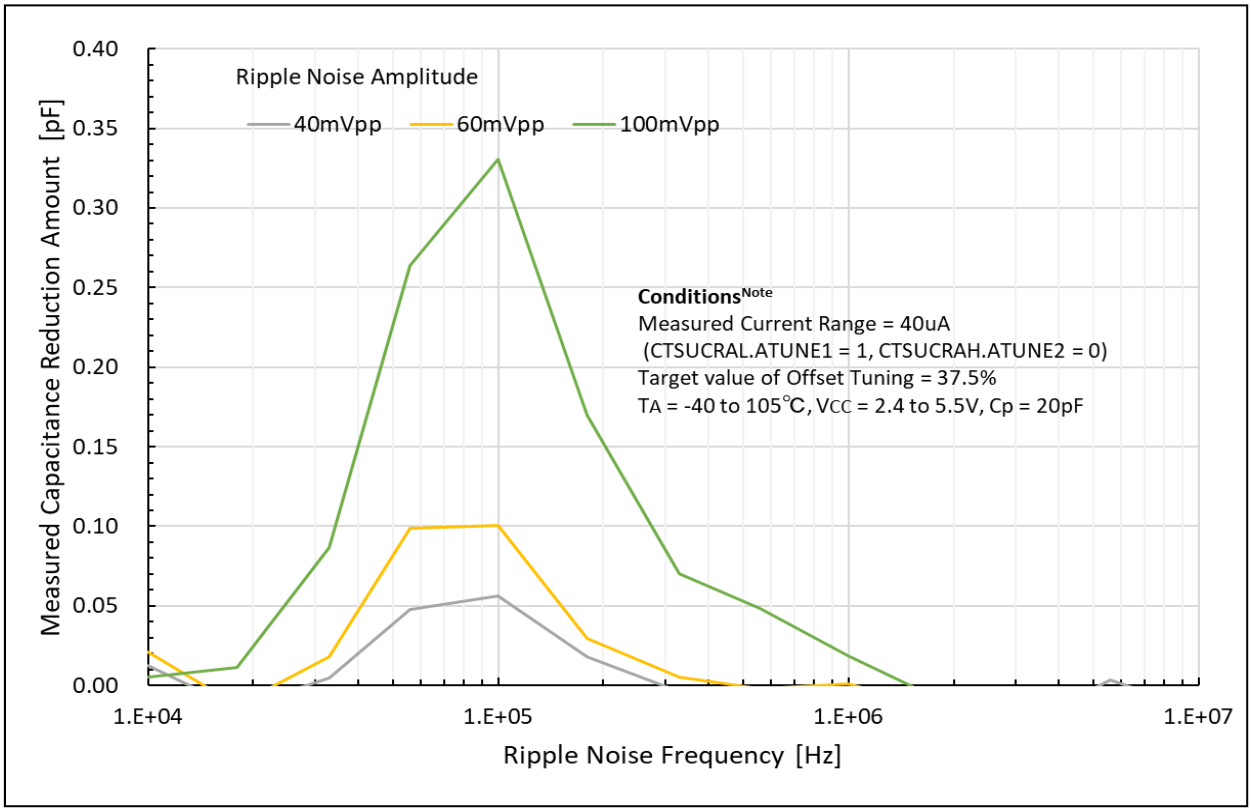

Figure 2 Measured Capacitance Reduction Amount

Note. Refer to the application note for Capacitive Sensor MCU, “Capacitive Touch QE for Capacitive Touch Advanced Mode Parameter Guide (R30AN0428)".